REMARKS

Claims 1, 6, and 7 are amended hereby. Claim 5 is canceled. No claims are newly added. Accordingly, after entry of this Amendment, claims 1-4 and 6-13 will remain pending. In view of the Applicant's election of claims 1-8 for further prosecution in the Response to Restriction Requirement dated January 4, 2006, and in view of the Amendments presented herein, only claims 1-4 and 6-8 are currently being examined.

In the Office Action dated March 22, 2006, the Examiner rejected claims 3 and 8 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicant regards as the invention. Specifically, the Examiner noted that the phrase "the process gas line" in line 7 of claim 3 lacks antecedent basis. In response, the Applicant respectfully points out that claim 3 specifically recites that the apparatus of claim 1 further comprises a process gas line and a control valve. Therefore, the use of the article "the" after the transition "wherein" is entirely appropriate. As a result, the Applicant respectfully submits that the rejection under 35 U.S.C. § 112, second paragraph, appears to be in error. Accordingly, the Applicant respectfully requests that the Examiner withdraw the rejection under 35 U.S.C. § 112, second paragraph.

In the Office Action, the Examiner also rejected claims 1 and 2 under 35 U.S.C. § 102(e) as being anticipated by Toshima et al. (U.S. Patent No. 6,709,523). Claim 1 was rejected under 35 U.S.C. § 102(e) as being anticipated by Ingle et al. (U.S. Patent No. 6,905,940). Next, the Examiner rejected claims 4-7 under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Ingle et al. Claims 2, 3, and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ingle et al. in view of Mitani et al. (Japanese Patent No. 3-281780). The Applicant respectfully disagrees with each of these rejections and, therefore, respectfully traverses the same.

Claims 1-4 and 6-8 are patentably distinguishable over the references cited because they recite a chemical vapor deposition apparatus that combines a number of features including, among them, a controller that controls the position control assembly such that the distance between the wafer and the gas supply assembly is increased as a time required to form the deposition layer elapses. None of the references, either alone or in combination, disclose or suggest such a combination. Accordingly, the references cannot anticipate or render obvious any

of claims 1-4 and 6-8. The Applicant, therefore, respectfully requests that the Examiner withdraw the rejections under 35 U.S.C. §§ 102(e) and 103(a) and pass this application quickly to issuance.

Toshima et al. describes a silylation treatment unit and method that seeks to improve the uniformity of the silylation layer. (Toshima et al. at col. 1, lines 48-63.) To accomplish this, Toshima et al. describes a construction for a chamber where an interval between a heating mechanism and a substrate may be adjustable to at least three fixed levels or more. (Toshima et al. at col. 2, lines 4-11.) As an overview, Toshima et al. describes that the substrate is brought into the chamber and is disposed a first distance from the heating mechanism, then the substrate is moved to a second distance from the heating mechanism so that the silylation atmosphere may be uniformly dispersed inside the chamber, and finally, the substrate is brought closer to the heating mechanism to raise the temperature of the substrate such that that silylation reaction occurs. (Toshima et al. at col. 2, lines 27-42.) Lifter pins 10 in the silylation treatment unit 1 adjust the wafer W to different heights above the hot plate 5. (Toshima et al. at col. 4, lines 39-54.)

The process described by Toshima et al. is as follows. First, the wafer W is transferred to the lifter pins 10, which are disposed a distance from the hot plate 5 of about 18 mm. (Toshima et al. at col. 8, lines 36-46.) After the silylation reagent vapor is introduced into the chamber, the hot plate 5 is heated and the wafer W is lowered to a distance of about 7 mm from the hot plate 5 until the silylation reagent vapor is uniformly dispersed within the treatment chamber. (Toshima et al. at col. 8, line 59, through col. 9, line 7.) Finally, the lifter pins 10 lower the wafer W to 0.1 mm above the hot plate 5 to raise the temperature of the wafer W and cause the silylation reaction to occur. (Toshima et al. at col. 9, lines 8-28.)

The structure of the chamber described by Toshima et al. is also relevant here. Specifically, the silylation treatment unit 1 includes a cover 8 with an exhaust pipe 17 extending therethrough. (Toshima et al. at Fig. 2; see also Toshima et al. at col.5, lines 9-14.) The silylation treatment unit 1 includes a supply ring 14, with supply holes 14a, that surrounds the hot plate 5 and supplies the silylation reagent vapor to the chamber. (Toshima et al. at col. 4, line 65, through col. 5, line 9.) As a result of this construction, the distance between the wafer W and the supply ring 14 remains fixed. (See, e.g., Toshima et al. at Fig 8B.) As illustrated in Figs. 3 and 8B, regardless of the distance of the wafer W from the hot plate 5, the wafer W remains

surrounded by the supply ring 14, with its gas supply holes 14a. (Toshima et al. at Figs. 3 and 8B, for example.) Accordingly, at no time is the distance between the gas supply assembly and the wafer increased during processing.

Turning to the process described by Toshima et al., there are at least two described aspects that render Toshima et al. wholly inadequate as a reference that may be applied against any of claims 1-4 and 6-8. First, the distance of the wafer W from the hot plate 5 is changed to alter the temperature of the wafer W. (Toshima et al. at col. 8, line 33, through col. 9, line 28.) Second, when the silylation reaction occurs, the wafer W apparently is held at a **constant** distance of 0.1 mm from the hot plate 5. (Toshima et al. at col. 9, lines 16-28.) Nothing in Toshima et al. suggests that the distance is altered before nitrogen (N_2) replaces the silylation reagent vapor in the chamber, thereby ending the silylation reaction. (Toshima et al. at col. 9, lines 29-50.) Accordingly, there is no discussion of the change in the height of the wafer W at any time when deposition layers are being formed.

In view of the foregoing, therefore, Toshima et al. fails to describe at least a controller that controls the position control assembly such that the distance between the wafer and the gas supply assembly is increased as a time required to form the deposition layer elapses. Since Toshima et al. fails to describe each and every feature of the invention as recited by claim 1, and claims 2-4 and 6-8 that depend therefrom, Toshima et al. cannot be relied upon to anticipate any of claims 1-4 and 6-8. Accordingly, the Applicant respectfully requests that the Examiner withdraw the rejection under 35 U.S.C. § 102(e).

Ingle et al. also fails to describe at least the same feature. Namely, Ingle at al. fails to describe a controller that controls a position control assembly such that the distance between the wafer and the gas supply assembly is increased as a time required to form the deposition layer elapses. As a result, Ingle et al. also fails to describe each and every feature recited by claim 1 or any of claims 2-4 and 6-8 that depend therefrom. Accordingly the Applicant respectfully requests that the Examiner withdraw the rejection of the claims under 35 U.S.C. § 102(e) over Ingle et al.

Ingle et al. describes a method of using TEOS ramp-up during TEOS/Ozone CVD for improved gap fill. As discussed in Ingle et al., a challenge presented in the manufacture of sub-micron devices lies in the ability to completely fill narrow trenches in a void-free manner. (Ingle et al. at col. 1, lines 43-45.) To accomplish this, Ingle et al. states that a two-step process may be

used. (Ingle et al. at col. 1, line 66, through col. 2, line 12.) Ingle et al. describes an improvement over a two-step process. Namely, Ingle et al. describes a process where, over time, a ratio of the silicon-containing gas:oxidizing gas is varied to alter the rate of deposition of silicon oxide on the substrate. (Ingle et al. at col. 2, lines 41-43.)

Ingle et al. describes a chemical vapor deposition ("CVD") system 10 that includes a vacuum chamber 15 that receives process and other gases from a gas delivery system 89. (Ingle et al. at col. 4, lines 12-25.) The CVD apparatus 10 includes a gas distribution plate 20 provided above the gas reaction area 16. (Ingle et al. at col. 4, lines 26-34.) The wafer rests on a vertically movable heater 25. (Ingle et al. at col. 4, lines 26-34.) The heater 25 can be moved between a lower position, where the wafer is loaded or unloaded, and a processing position close to the gas distribution plate 20. (Ingle et al. at col. 4, lines 33-40.)

The CVD system 10 operates to alter the flow rate 9 tetraethylorthosilicate ("TEOS") during processing to alter the amount of silicon oxide deposited. (Ingle et al. at col. 12, lines 23-47.) In addition, to further increase the rate of deposition of silicon oxide and other materials, the spacing between the wafer and the gas distribution plate is **decreased** from 300 mils to about 100 mils. (Ingle et al. at col. 12, lines 29-64, emphasis added.)

As the discussion makes abundantly clear, the distance between the wafer and the gas distribution plate 20 **decreases**. This is contrary to the invention recited by claims 1-4 and 6-8 when the distance is **increased** as time elapses. Since Ingle et al. does not teach each and every feature recited by claims 1-4 and 6-8, Ingle et al. cannot be relied upon to anticipate any of claims 1-4 and 6-8. Accordingly, the Applicant respectfully requests that the Examiner withdraw the rejection of certain of the claims under 35 U.S.C. § 102(e).

In the Office Action, the Examiner also asserted that claims 4-7 were alternatively rejected as being obvious over Ingle et al. The Applicant does not believe, given the discussion above, that Ingle et al. may be relied upon to render obvious any of claims 1-4 or 6-8. Specifically, as discussed, Ingle et al. describes a CVD system 10 where the distance between the wafer and the gas distribution plate 20 is **decreased** during processing. (Ingle et al. at col. 12, lines 59-64.) This is the opposite of the construction recited by claims 1-4 and 6-8 where the controller **increases** the distance between the wafer and the gas supply assembly during processing. No-one skilled in the art, upon reading Ingle et al., which describes decreasing the distance during processing, would reach the conclusion that the opposite, namely increasing the

distance, should be employed. There is no discussion or suggestion in Ingle et al. that would motivate those skilled in the art to employ a construction that is opposite to that described by Ingle et al. Accordingly, Ingle et al. cannot be relied upon to render obvious any of claims 1-4 or 6-8. As a result, the Applicant respectfully requests that Examiner withdraw the rejection under 35 U.S.C. § 103(a) with respect to Ingle et al.

With respect to the rejection of claims 2, 3, and 8 under 35 U.S.C. § 103(a) as being obvious over Ingle et al. in view of Mitani et al., the Applicant first relies on the discussion above of Ingle et al. to reiterate that Ingle et al. is insufficient as a base reference upon which to construct a rejection of claims 2, 3 and 8. Mitani et al. does not cure the deficiencies noted with respect to Ingle et al. As a result, Mitani et al. cannot be combined properly with Ingle et al. to render obvious any of claims 1-4 or 6-8.

Mitani et al. describes a CVD device with a gas feeding nozzle with concentrically-arranged nozzles. (Mitani et al. at translation p. 2, lines 4-8.) By providing concentrically-arranged nozzles and by adjusting the gas flow amount, it is possible to correct and equalize the distribution of the gas partial pressure, thereby improving the distribution of the CVD film thickness. (Mitani et al. at translation p.4, lines 7-17.) In addition, Mitani et al. describes that the distance (111) between the susciptor (16) and the gas nozzle (17) was made to be 5 to 15 mm. (Mitani et al. at translation p.5, lines 20-22.) While this suggests that the distance (111) may be controlled, there is no discussion of the distance (111) being changed during the time required to form the deposition layers. Accordingly, Mitani et al. does not cure the deficiencies noted with respect to Ingle et al. As a result, the Applicant respectfully submits that the rejection of any of the claims based on the combination of Ingle et al. and Mitani et al. should be withdrawn.

Each of the rejections having been addressed, the Applicant respectfully requests that the Examiner reconsider the rejection of the claims and withdraw the rejections.

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Respectfully submitted,

PILLSBURY WINTHROP SHAW PITTMAN LLP

JEFFREY D. KARCESKI
Reg. No. 35914
Tel. No. 202.663.8403

Date: June 22, 2006
P.O. Box 10500
McLean, VA 22102
(703) 770-7900